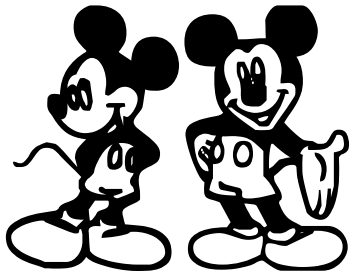
Financial Maths

Investing Money



General Maths

Name: _____

CAPACITY MATRIX – GENERAL MATHEMATICS

TOPIC: Financial Maths 2 – Investing Money 2 weeks

CONTENT	CAPACITY BREAKDOWN!	DONE IT!!!!	GOT IT!!!!!	ON MY WAY!	WORKING ON IT!	HELP!!!!
1. Calculation of Simple interest 2. Linear graphs that describe I against n for differing values of r 3. Calculation of monthly, quarterly, six-monthly interest rates based on quoted rates per annum	Ex 8A Q1-5, 8-13 Ex 8B Q1,2, 6, 7 Ex 8A Q15-17 Simple interest S/S p221					
4. Use of formulae to calculate future value, compound interest and present value	Ex 8C Q1, 3-16 Compound interest S/S p227					
5. For fixed principals, using tables of values, drawing and describing graphs of A against n for differing values of r.	Ex 8D Q1, 2, 5, 10, 11-13, 15 Ex 8E Q1, 2, 6, 7					
6. Calculation of dividend paid on a share holding and the dividend yield, excluding franked dividends	Ex 8F					
7. Extrapolating from a graph of share performance to suggest possible future movement.	Ex 8G Q1-3					
8. Calculating future and present value of an investment from prepared tables.	Ex 8G Q4-5					
9. Calculation of the price of goods following inflation.	Ex 8H Q1-9					
10. Calculating the appreciated value of items such as stamp collections, memorabilia.	Ex 8H Q10-12					

Simple Interest

Simple Interest is calculated on a fixed amount called the **principal,** which is generally the amount borrowed.

The amount of interest is the same each year.

Simple interest is also called **flat-rate interest**.

It is calculated using the formula:

$$I = \Pr n$$

Where

I = simple interest (%);

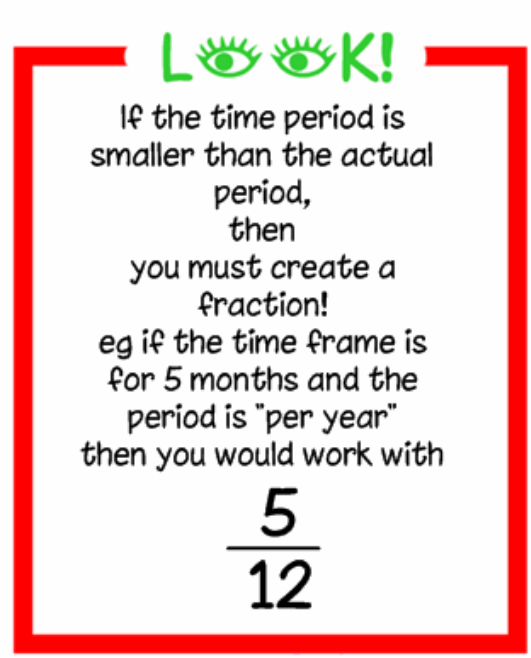
P = principal ($);

R = rate (as a decimal or fraction)

N = number of periods according to the interest rate

eg if the rate is “per annum” then the period is a year;

if rate is “per month” then the period is a month



eg Find the simple interest charged on $2 580 at 12% pa for 3 years

eg Find the simple interest on $4 500 at 9%pa for 7 months

eg Sarah wants to earn $1 500 a year in interest through a lending institution who offers simple interest. How much must she initially deposit when the interest rate is $10%pa.

eg Amie borrows $42 000 for 5 years at a flat rate of 8.75% pa. the loan, including the interest, is to be repaid in equal monthly instalments. What is the amount of each monthly instalment?

Graphing simple interest functions

The amount of simple interest earned on an investment can be presented as a linear function (straight line graph)

The gradient of the linear function will be equal to one year's interest.

To compare the interest earned at various rates, graph sets of functions on the one set of axes.

Scott has $12 000 to invest. Three different lending institutions offer interest rates of 4%, 5% and 6%.

a) Complete the table below to show the interest he would earn over 5 years.

No of years	1	2	3	4	5
4% interest					
5% interest					
6% interest					

b) Present this information in graphical form.

Compound Interest

In practice, most investments are not calculated using simple interest.

When interest is added to the principal and this new balance is used to calculate the next interest payment, this is called **COMPOUND INTEREST.**

We can calculate compound interest by calculating simple interest one period at a time.

The amount to which initial investment grows is called the **compounded value** or **future value.**

METHOD 1: If the question asks you to calculate compound interest, displaying the interest for each year separately, use the simple interest formula for each year. Add it to the principal and repeat the process.

METHOD 2: If the question simply wants the final value (future value) applying compound interest, use the compound interest formula:

Compound Interest

$$A = P\left(1 + \frac{r}{100}\right)^n$$

Where:

- A is the total of the principal and interest after n periods;
- P is the principal;
- r is the interest rate per period*;
- n is the number of periods

* In most cases interest is compounded annually, however this is not always the case. It may be paid six-monthly, quarterly, monthly or even daily! This is called the **compounding period.** When this occurs, you must calculate the number of periods that will occur in the given time frame AND the interest rate must be converted from **rate per annum** to **rate per compounding period.**

eg Calculate the future value of an investment of $13000 at 10% for 3 years with interest paid at the end of each year, by calculating the simple interest for each year separately.

b) Calculate the interest made;

c) Compare this with the simple interest earnings at the same rate.

eg $65 000 is invested for 5 years at 5% pa compounded quarterly. Calculate:

a) the total amount at the end of 5 years;
b) the amount of interest earned during this period

eg Calculate the amount that must be invested at 8% pa compounded annually to receive $20 000 at the end of 5 years.

eg Calculate the number of years that an investment would have to cover for an initial investment of $10000 to make $33000 at a rate of 6.5% pa compounded annually.

CALCULATING COMPOUND INTEREST FROM A TABLE OF COMPOUNDED VALUES.

Before spreadsheets and calculators became widely available, accountants used **financial tables** to calculate compound interest. The table lists the **CVIF** (compound value interest factor) which is simply the value of compound interest plus principal calculated for $1.00. In other words - $(1 + r)^n$
So, if we were to use the table to calculate the compound interest on a specific amount, we would find the CVIF listed for the corresponding interest rate and number of periods, and multiply by the principal.

Amount = principal x CVIF

COMPOUND INTEREST TABLE $(1 + r)^n$
FINAL AMOUNT OF INVESTMENT (PER DOLLAR)

	Interest rate per compounding period (r)					
No. of periods (n)	0.01 1%	0.05 5%	0.08 8%	0.1 10%	0.15 15%	0.2 20%
1	1.010	1.050	1.080	1.100	1.150	1.200
2	1.020	1.103	1.166	1.210	1.323	1.440
3	1.030	1.158	1.260	1.331	1.521	1.728
4	1.041	1.216	1.360	1.464	1.749	2.074
5	1.051	1.276	**1.469**	1.611	2.011	2.488
6	1.062	1.340	1.587	1.772	2.313	2.986
7	1.072	1.407	1.714	1.949	2.660	3.583
8	1.083	1.477	1.851	2.144	**3.059**	4.300
9	1.094	1.551	1.999	2.358	3.518	5.160
10	**1.105**	1.629	2.159	2.594	4.046	6.192

eg Use the table to calculate the final amount of:

a) $2000 invested at 8%pa for 5 years;

b) $11 000 invested at 15% per month for 8 months;

eg How long will it take $3000 to grow to $3200 when invested at 16% pa with interest compounded six-monthly?

eg Calculate the interest rate required for $12 000 to grow to $19 500 in 5 years with interest compounded every six months?

Investing in shares

When you invest in shares, you acquire a part ownership of a company. You can buy shares through a stockbroker, at the stock exchange or on the internet.

TERMS YOU NEED TO KNOW:

- **Brokerage:** is the commission charged by a stockbroker.
- **Stamp Duty** is the tax you pay when buying or selling shares;
- **Face value (or par value)** of a share is its original value.
- **Market value** of a share is the value for which it is currently traded on the stock market.

- **Dividend** is the amount of money a shareholder receives for every share he or she owns. A dividend is generally calculated on the face value of the share.

$$Dividend = profit \div numberofshares$$

- **Dividend yield** is the dividend expressed as a percentage of the present market value of the share. $Yield = \frac{dividend}{marketvalue} \times 100\%$

The value of the dividend yield makes comparisons with other investments possible.

eg BNQ has an after-tax profit of $34.2 million. There are 90 million shares in the company. What dividend will the company declare if all profits are distributed to the shareholders?

eg Share is RONAELE Holdings were good value at $1.70 per share. Luke purchased 1 500 shares. In April DIVAD paid a dividend of 23 cents per share.

a) How much did Luke receive in dividends?
b) In April the market value of the shares was $1.80 per share. Calculate the dividend yield Luke received.

eg Mitch bought 2 000 Commonwealth share at $3.20 per share. At the end of the year the shares were worth $3.70 each and the Commonwealth company paid a dividend yield of 14%.
How much did Mitch receive?

Eg Gavin buys 5 000 shares in a company. The face value is $1.50 per share and the market value is $2.10 per share. The company declared a $0.15 dividend on all shares.

a) What is the total dividend return?
b) What is the yield on this investment?

SHARE MARKET GRAPHS

Daily information about share prices can be found in the Finance section of a newspaper or on the Internet (www.asx.com.au/).

An example of a table of share information is given below:

52 week		Company	Last sale	Move	Buy	Sell	Div. cents	Div. yield %
High	Low							
12.29	8.53	AGL	8.70	−9	8.68	8.70	45.00	5.17
4.00	2.35	Angus and Coote	3.80		3.21	3.80	20.00	5.26
1.75	1.25	Just Jeans	1.28	+3	1.24	1.28	10.00	7.81
5.40	2.38	Qantas	4.93	+19	4.95	4.76	19.00	3.85
5.93	4.15	Seven Network	4.45	+6	4.45	4.50	20.50	4.61
1.91	0.95	Sydney Gas	1.468	+1.8	1.47	1.48	4.00	2.72
3.58	2.63	TAB	2.66	−1	2.65	2.66	9.00	3.38
12.11	9.15	Westpac	9.548	−0.2	9.60	9.51	45.00	4.71

Key

52 week high/low: the maximum and minimum prices of the share in the last 52-week period (in dollars)

Last sale: the market price of the share (in dollars)

Move: the change in cents of the market price compared to yesterday's price

Buy: the highest buying price offered during the day

Sell: the lowest selling price offered during the day

Div. cents: the dividend per share in cents

Div. yield %: the dividend yield

eg From the table:

a) What is the market price of Qantas shares?

b) What was their price yesterday?

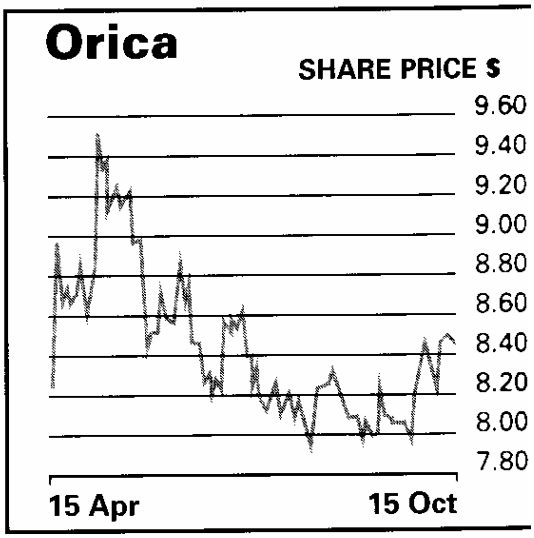
c) What was the lowest price of AGL shares over the last 52 weeks?

d) Which share paid a dividend of 20.5 cents?

e) What was the lowest selling price of Just Jeans share during the day?

f) What was the dividend yield on TAB shares?

g) If the TAB dividend was paid today, what would it be (to the nearest o.1 cent)



Source: Bloomberg, *Sydney Morning Herald*, 16 October 1999.

This graph displays the performance market price of Orica shares over 6 months.

a) What was its highest price during this period?

b) How many times did the price reach $8.40?

c) Describe the performance of the share over the period?

d) Draw a line of best fit and extrapolate the share price movement after 15 October.

Inflation and Appreciation

Inflation is the rise in value of all the goods and services that we use. It is related to other changes in the economy and is generally expressed as a percentage rate.

Appreciation is the increase in the value of an item;
Depreciation is the decrease in the value of an item.

If the rate of inflation or appreciation is constant over a number of years, we can use the compound interest formula in the form:

$$Futurevalue = presentvalue\left(1+\frac{\text{inf}\,lationrate}{100}\right)^{n}$$

If the rate of depreciation is constant over a number of years, we can use the formula is this form:

$$Futurevalue = presentvalue\left(1-\frac{rateofdepreciation}{100}\right)^{n}$$

eg The price of a car now is $56 000. The price increases at the same rate as inflation. If the inflation rate is 2.5% pa, what would you expect to pay for the car in two years time?

eg A rare antique table appreciates by 9% per year. If it costs $8 000 now, what will it be worth in 5 years?